Interact Switch

Assembly Instructions

About

The Interact Switch is a freely available set of designs for a high quality 3D printable adaptive switch. It is intended to be inexpensive, easy to make, durable, and highly configurable. The switch requires very little force to operate, so those with the very lightest touch will be able to activate it.

Disclaimer: Any designs or instructions are provided without any guarantees or warranties nor fitness for any particular use. There may be mistakes and/or omissions. By choosing to use any materials related to the Interact Switch, you agree to take full responsibility for anything you make and to indemnify the creators of the Interact Switch from any action associated with any switches or devices you build. You agree that when you make any switch or device, even when following directions herein, you make many material decisions including but not limited to material choice, slicer settings and post processing. You alone are responsible for determining the fitness for any particular use of any device you make.

You can find the most up-to-date version of this document here: https://docs.google.com/document/d/1uWRKXmApZUaSo1I0oyyFrAfncziYsd2_8ai8dunogJs/edit?usp=sharing

Configuration Options

One of the best aspects of 3D printing is customizability. With pretty much all commercial switches, there is little option to customize. At best, you may be able select between several colors. With the Interact switch, color is just the starting point for customization. There are a variety of shapes and even textures that you can pick from. You can even pick between push-button style switches or wobble switches.

Examples

Cost

In designing this switch, cost was a big consideration. While I wasn't willing to compromise quality here, keeping the overall cost low was very important. If you're only wanting to build one or two switches, you should be able to make an Interact Switch much cheaper than commercial offerings, but shipping costs will be a big percentage of your overall costs. On the other hand, if you're looking to build, say 50-100 switches (or more) then you can pretty easily get the per-switch cost under $3 USD per switch for parts and material (including filament).

Required Parts

- 1 Switch Base (3D printed)
- 1 Switch Holder (3D printed)
- 1 Switch Insert (3D printed)
- 1 Switch Cap (3D printed)
- 1 Omron SS-3GP limit switch (example source: https://octopart.com/ss-3gp-omron-146274)
- Mono Patch Cable (example source: https://www.monoprice.com/product?p_id=644 This can be cut in half and used for two switches) I've also had a lot of success with this cable from AliExpress. It's a good length, thick thick wires, and comes pre-tinned which is nice when making a bunch of switches: https://www.aliexpress.com/item/32932910517.html

- 3 M2.5x12 Pan Head screws (any length from 8-12 should work well)

Printing

General

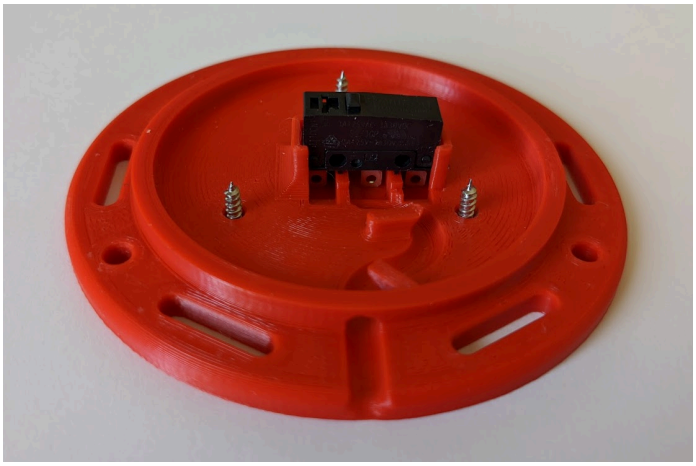
The tolerances for this switch are pretty tight. It is possible to adjust for variable offsets at build time using different switch inserts inserts, however changes in switch dimensions after building could easily make the switch unusable. For that reason, I recommend using either ABS or PETG filaments for the switch. PLA has a tendency to deform at lower temperatures; if a switch was left in a hot environment, the deformation could easily ruin the switch.

Unless mentioned below, it is recommended to use 0.2mm layer heights for all switch parts, although this is not a hard requirement.

Note: Development of the Interact Switch was done on a Prusa MK3S.

Switch Base

The Switch Base is the foundation of the switch. The only issues you're likely to encounter is warping on this part if you're using ABS. I do recommend using support on the base only, to support the first layer that goes around the screw holes. If you forget to do that, or choose to not use support, it'll probably turn out fine anyway. Once everything is dialed-in, this is usually a no-fuss part to crank out.



Switch Base with limit switch and screws inserted.

Cap Holder

The Cap Holder is a relatively small part that prints well. If your printer can handle bridging overhangs, no support should be needed. Even if the overhang looks a little ugly on your part, it'll probably still work just fine.

Switch Insert

This is a special little part. The Switch Insert comes with a number of different thicknesses (measured as the height of the round circle in the middle) in increments of 0.1mm. You will need to pick the thickness to use that best "tunes" your switch (i.e. to make sure that the Switch Cap is neither too loose, nor so tight that it stays depressed).

The Switch Insert should always be printed with 0.1mm layer height.

For your first switch, you're probably unsure of which size of insert you'll need. I'd recommend printing several sizes at first, and see which one works best. Probably start with a 0.4mm, 0.5mm and 0.6mm insert. You may still need a different size, but this should get you started on the right path.

Switch Cap

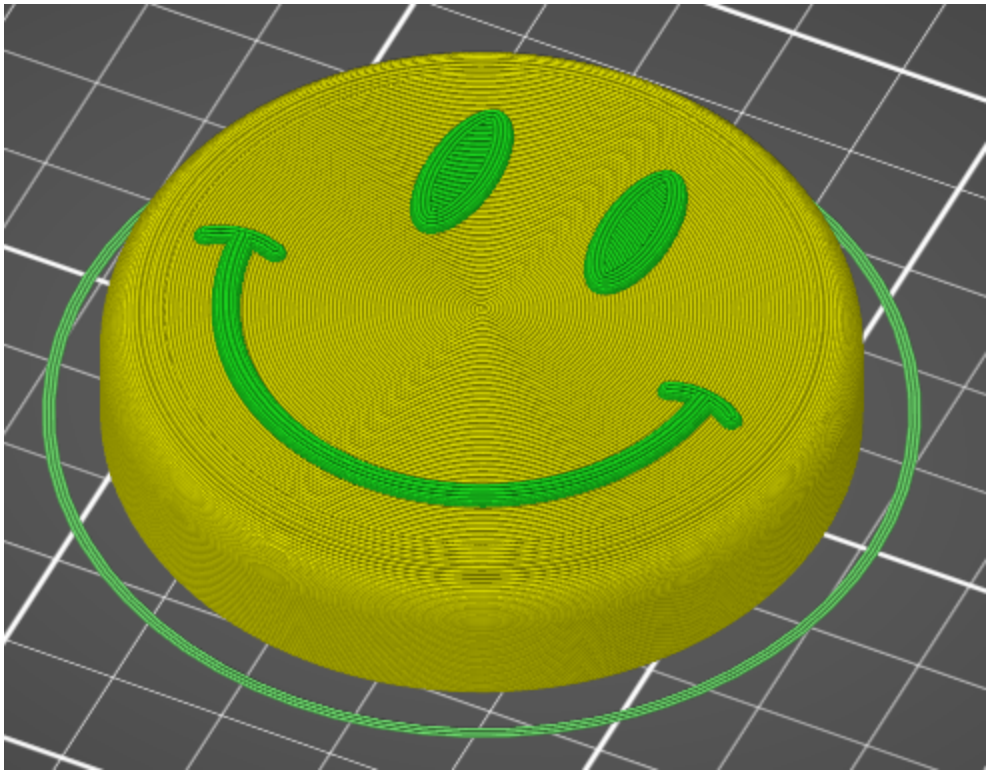
Support

There are a wide variety of switch caps, but there is still a lot of similarity among them. When printing, unless your printer and filament are really good at bridging long distances, you'll want to use support. However it's also a pain to remove support from the small areas around the edges of the cap, where the support really isn't needed in the first place. If your slicer allows, I recommend limiting support material to a cylinder with a diameter of 37mm centered on the middle of the switch. For Prusa Slicer, this means setting supports to "For Support Enforcers Only" and then creating the requisite 37mm diameter cylindrical support enforcer.

Multi-Color

A number of switch cap designs include textures or graphics on the top. While you can print these caps in a single color, they're intended to be printed with a color change at the layer

where the design starts. This doesn't require a special printer, it just requires having your slicer insert a "filament change" command at the given layer.



Wobble Switches (for wobble switches only)

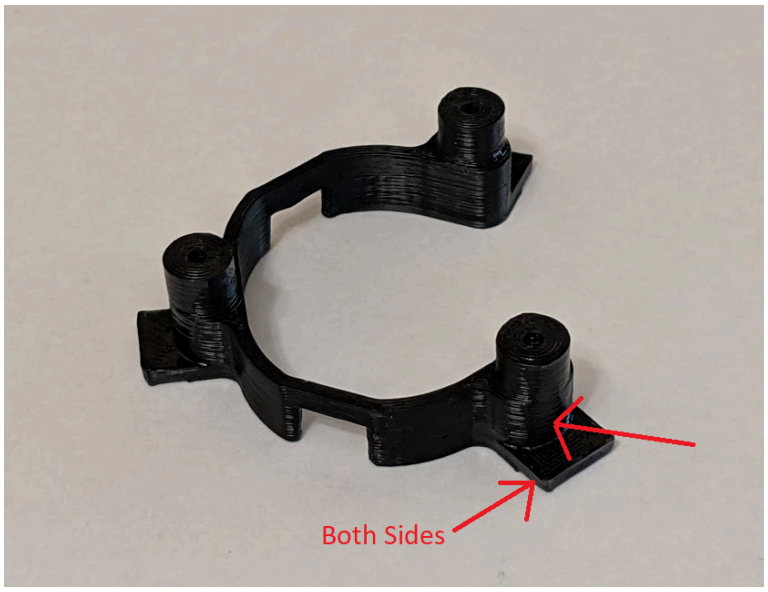
You can think of the wobble switches as just having a special 2-part Switch Cap. The bottom should be printed in a hard plastic such as ABS or PETG, just like all the other Switch Caps. But the top must be printed in a flexible filament. Why not print the Wobble Top in a hard filament? Simply put, you don't want anyone to be stabbed by your switch. Big hard pointy things are not good. Big squishy things with blunt ends are much better. While I can't prevent you from printing these in a "hard" filament, I implore you to please only use a flexible filament for these. And also test your prints after they're made to make sure that they're not too firm. You may need to adjust wall thickness, infill, or something else to make sure that these are soft enough to flex well before they could hurt anyone.

Post Processing

I've tried really hard to limit the amount of post processing necessary. There are chamfers at the bottom of parts to eliminate "elephants foot"-- that ridge around the base of parts that needs to be smoothed off. You should be able to use most parts just as the come off the printer without any extra work. That said, there are a couple things you can do to make a superior switch.

Cap Holder

Some extra post processing on the Switch Holder can really increase the smoothness of the feel of the final switch. Some light sanding of the locations on the Switch Holder where it mates with the Switch Cap will definitely help (a small file can work really well here). If you printed this in ABS, you can also use some acetone on a small paintbrush to smooth out the same areas.

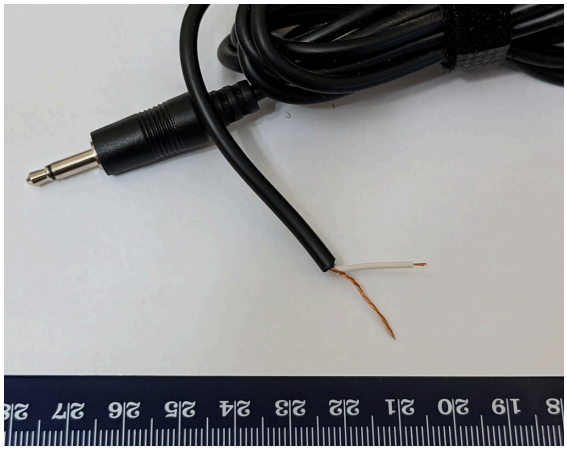


Assembly

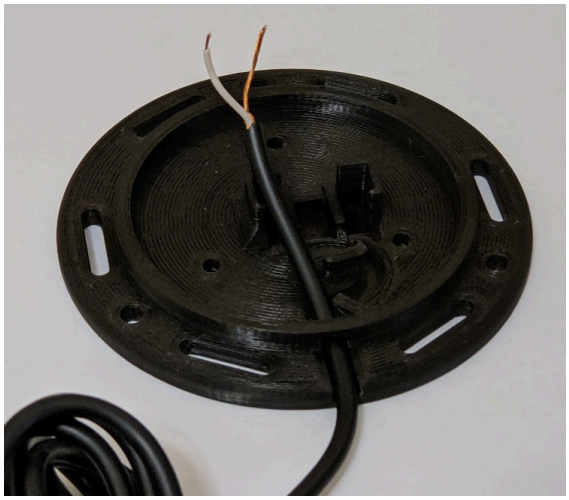
1. Cut one end off of your mono audio cable and strip about 15mm from the end.
   (Note: You may have a different wire than the one shown below. In that case, you will need to expose the two wires needed for switch activation. If you have three wires instead of two, and are unsure which wires are the two you need to use, you can strip all three, plug the other end of the wire into a switch adapted device. Then determine

which two wires will activate the device when they are touched together-- those are the wires you'll need.)

2. Twist all of the copper wires together into a single twist, and strip roughly 2 mm off of the remaining wire.

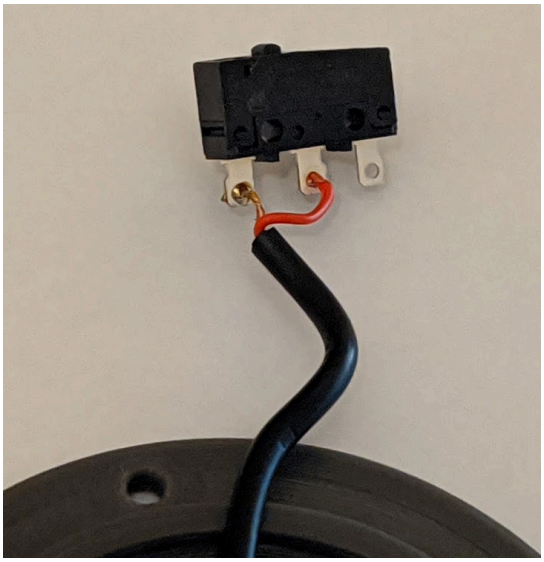


3. Thread the wire through the Switch Base. You will not be able to do this after you solder the limit switch onto the wire.

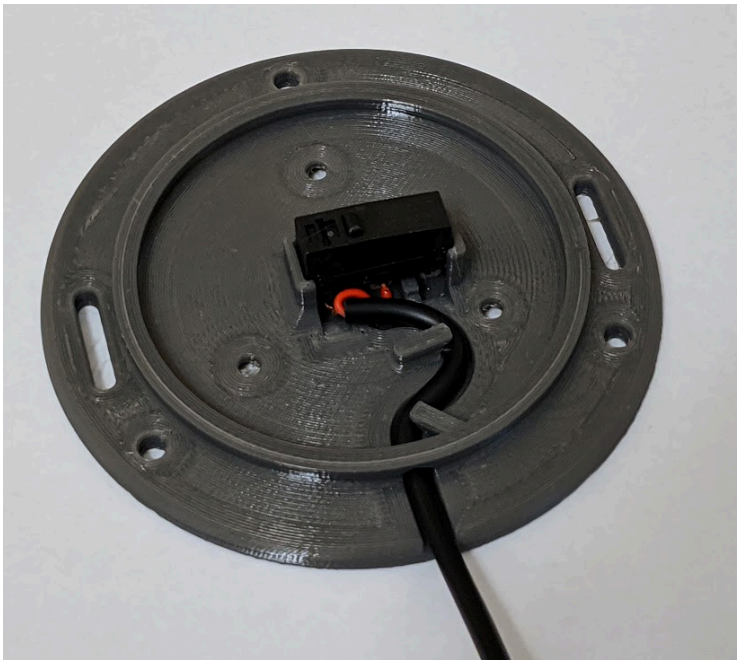


4. Next, solder the wires into the switch in the position shown below. Make careful note of the orientation. *(Hint: If one of the wires is thicker (i.e. the twisted copper), then it is best*

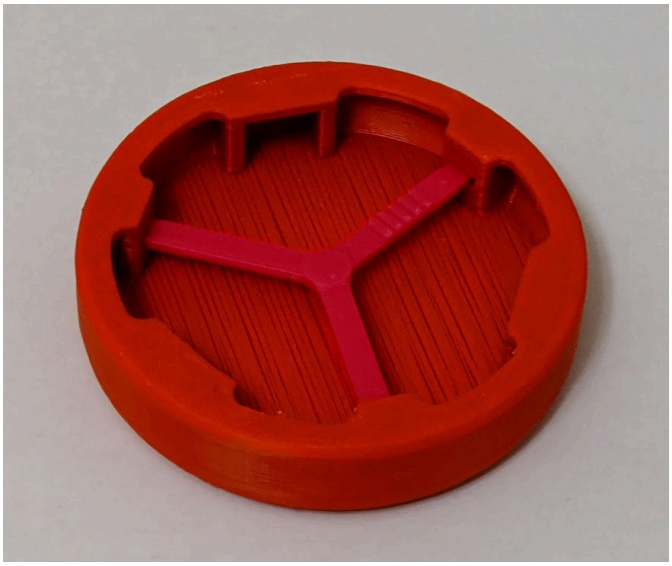
to insert it a little farther than the other wire. That way, if there is any stress on the wires in the future, it will pull the most on the thicker, stronger wire.) (Hint: At this point, you can test that your switch works by plugging it into a switch activated device and pushing the button on the limit switch.)



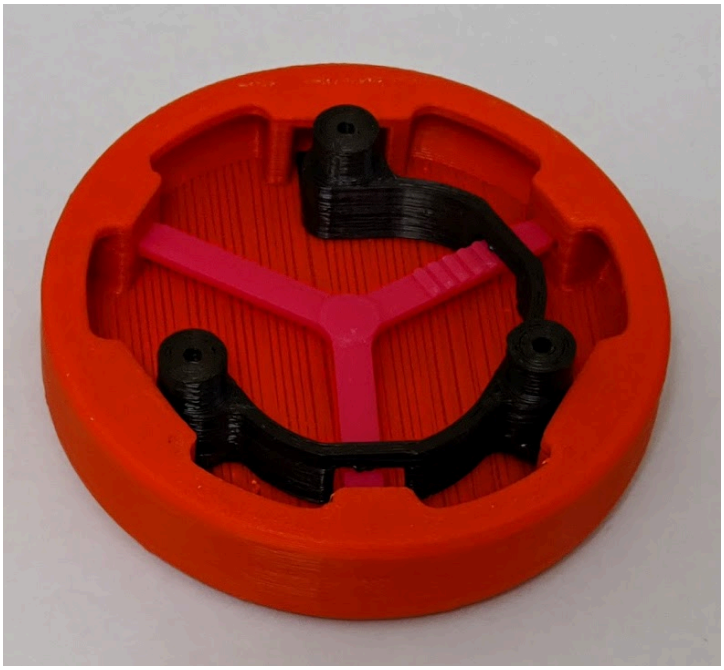
5. Secure place the limit switch into the Switch Base as shown below. Make sure that no wires are stuck underneath, preventing the limit switch from going all of the way down. Also, now is a good time to push the wire in the slot as shown in the picture below.



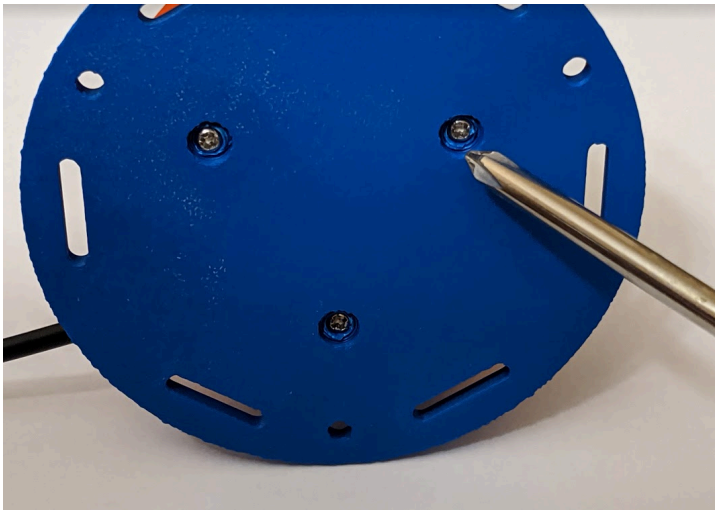
6. Now let's prepare the Button Cap. Turn the Button Cap over and insert the Button Cap Insert. If you're unsure which size to use, try starting with a 0.5mm. After you've assembled and tested your switch, you can still take it apart and try a different size to see what works best. If you've already made a few switches, you probably already know what size is going to work best for you.



7. Next, insert the Switch Cap Holder. The orientation of the “open” side doesn’t matter.



8. All that’s left is to use three screws to attach the Switch Cap Holder to the Switch Base. Be careful not to over tighten the screws: tighten them until you notice the resistance increases and the Switch Cap Holder is firmly against the Switch Base.



9. The last thing to do is test your switch. If this is your first switch, you'll likely need to test it out and figure out the best size of Switch Cap Insert to use.

Testing

The first thing I do to test a switch is to push it. A lot. Tap it everywhere, repeatedly. Every time you push it, you should hear it click down and click as it goes back up. It should never stick. Wiggle the top. It should certainly move some, but it shouldn't feel like it's rattling around. Next, plug the switch into a switch activated device and make sure that it works.

Troubleshooting

Problem	**Solution**
The switch cap is too loose and rattles around easily.	Use a larger/ thicker Switch Cap Insert.
Switch doesn't make any noise when pushed.	Use a smaller/ thinner Switch Cap Insert. An insert that is too big can cause the limit switch to be always depressed. When this is the case, you'll often hear the limit switch "click" closed when you're screwing everything together, but it won't ever click open.
Switch sticks/ doesn't always go back up.	Use a smaller/ thinner Switch Cap Insert. You may likely need just one size thinner.
Switch makes clicking noise, but the switch activated	• Test the switch activated device with a known-good switch, just to make sure it's working fine.

device isn't activating	● Check that the plug is firmly plugged into the device ● The solder connection may be bad and need to be re-soldered. ● There may be an internal break in the wire, and you will need to replace it. This is a particularly common failure point for an older switch.

Sources

The latest source files can be found here: https://github.com/mwturvey/InteractSwitch